



Government Industry Crosstalk

**The Role of Test & Evaluation
in the Evolution of New Defense Industry
Realities**

**Hon. Philip E. Coyle
Director, Operational Test & Evaluation**

May 1998



Fundamental Principle: Weapons that Work



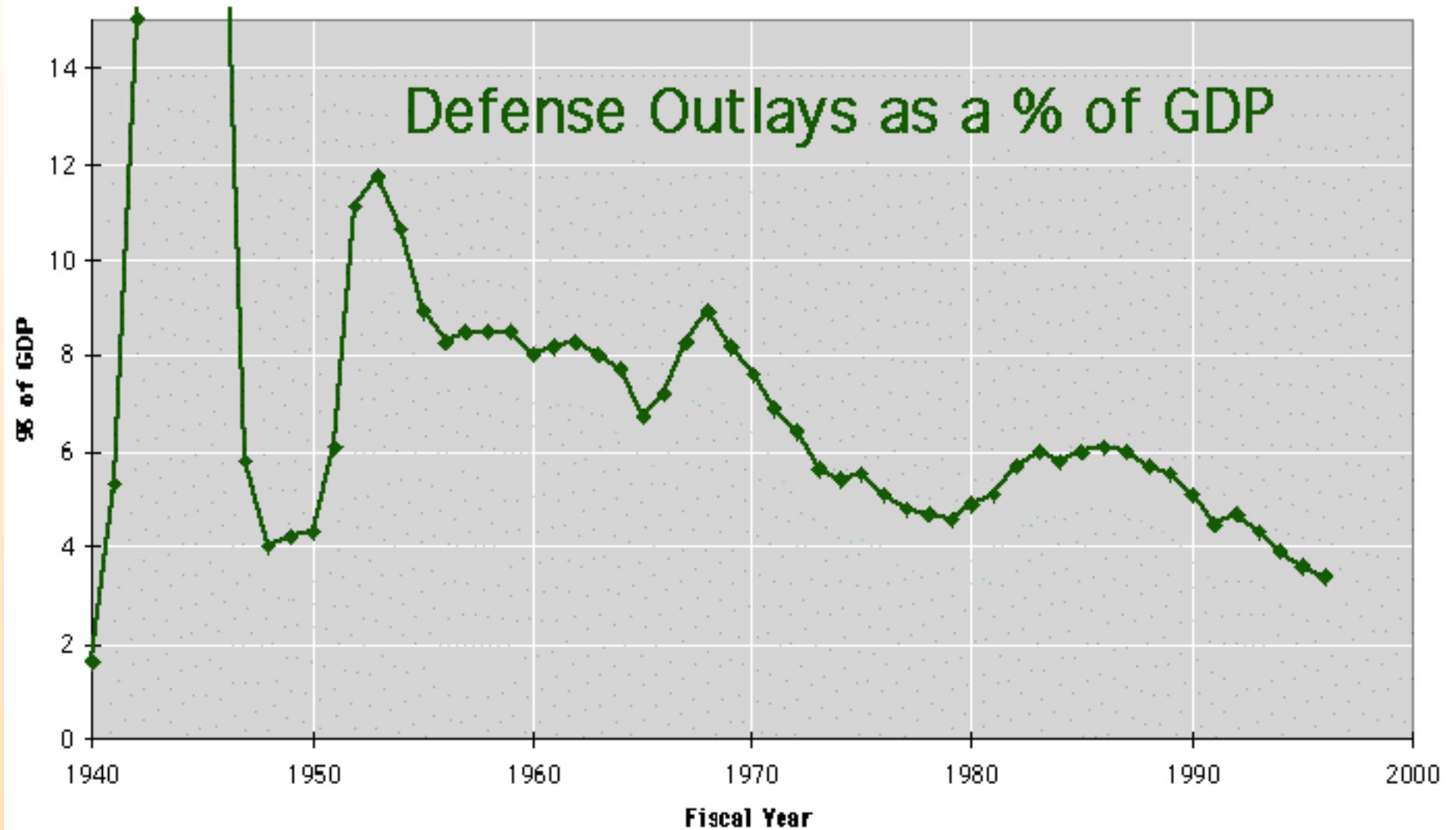


Great Change in Defense During the Last Ten Years

- **Spending**
- **Structure of the industrial base**
- **The threat**
- **Down-sized military**
- **Role of the CinCs / Joint Operations**
- **Technological innovation.**

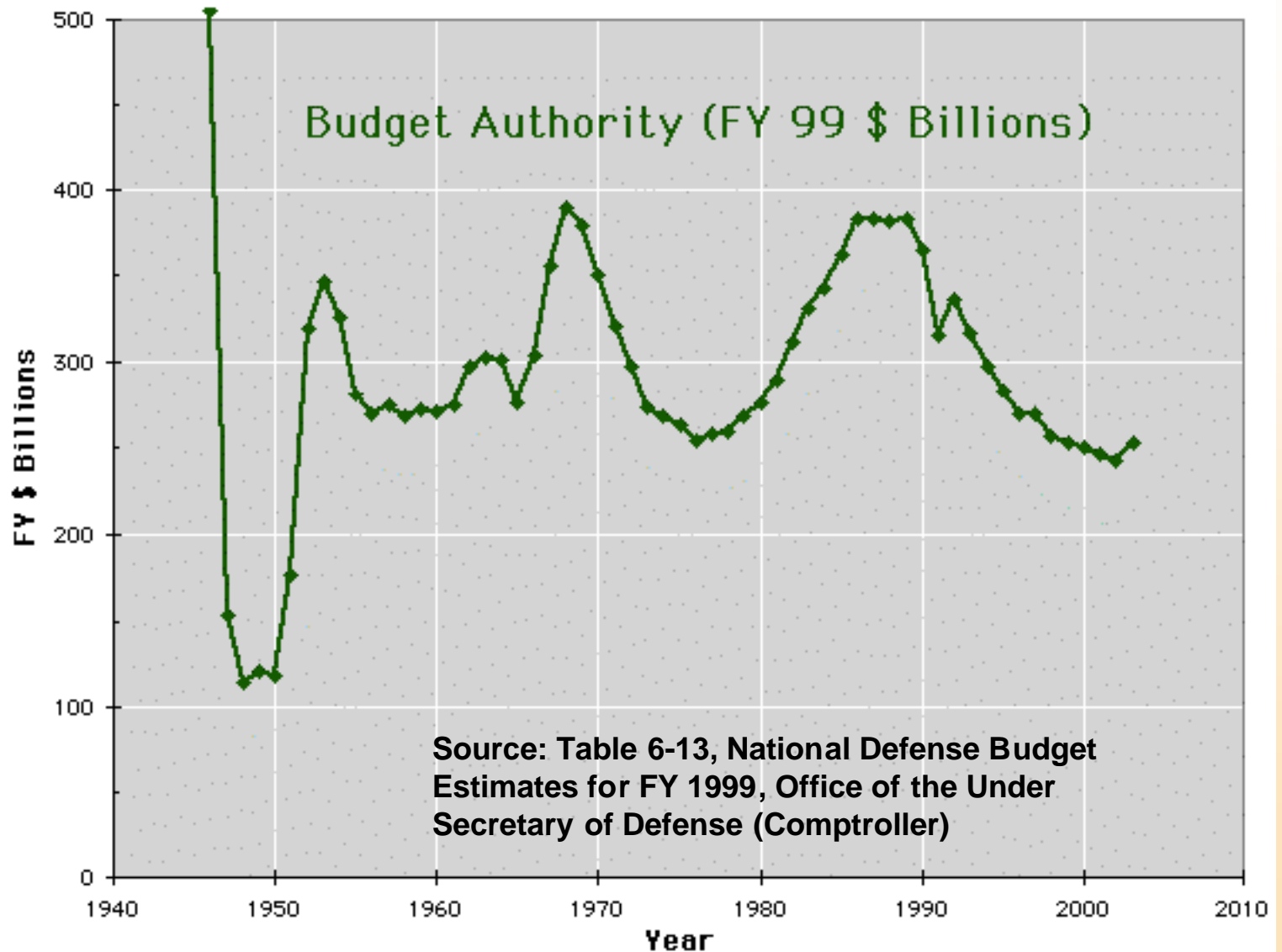


Spending





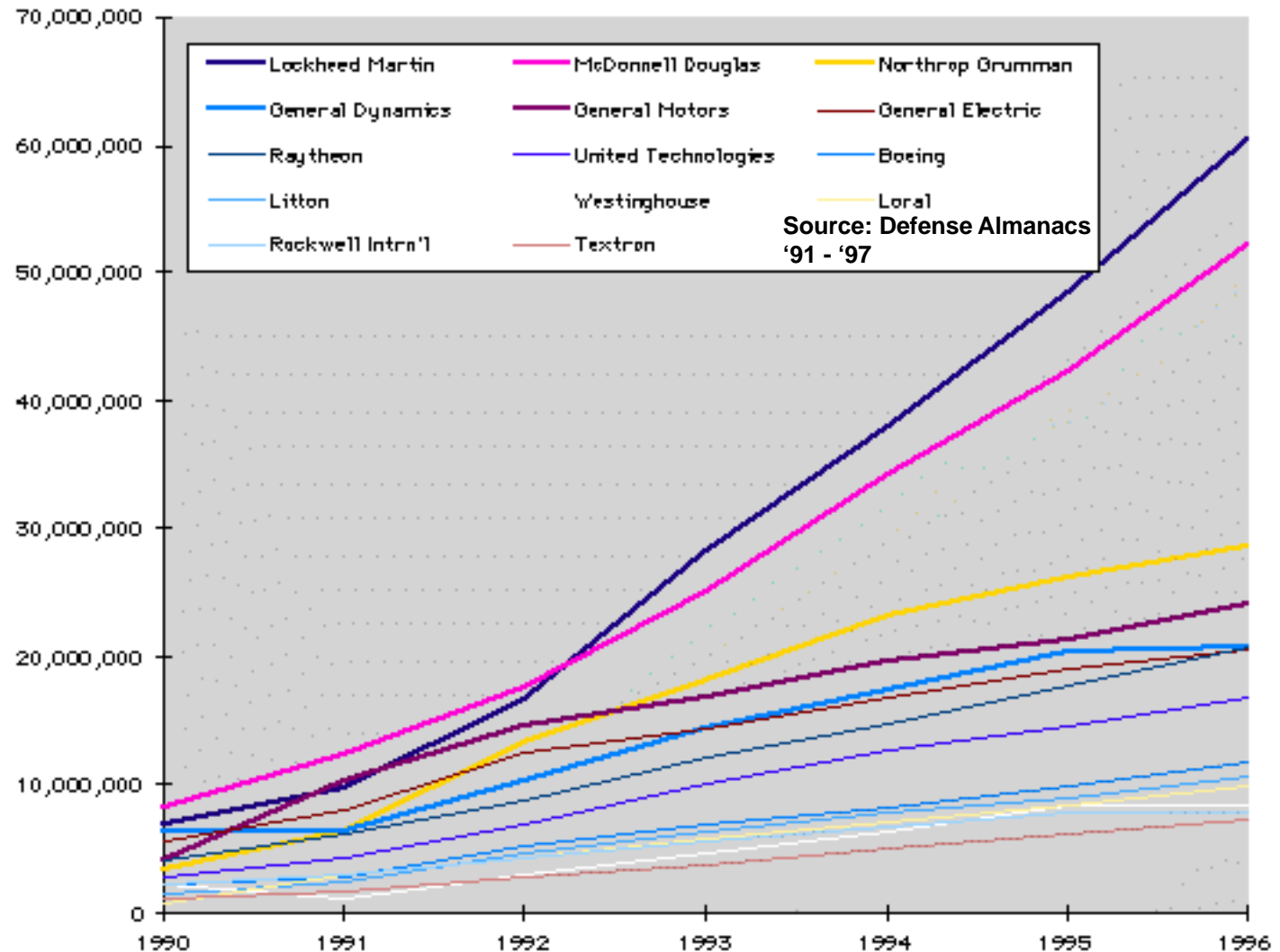
Budget Authority





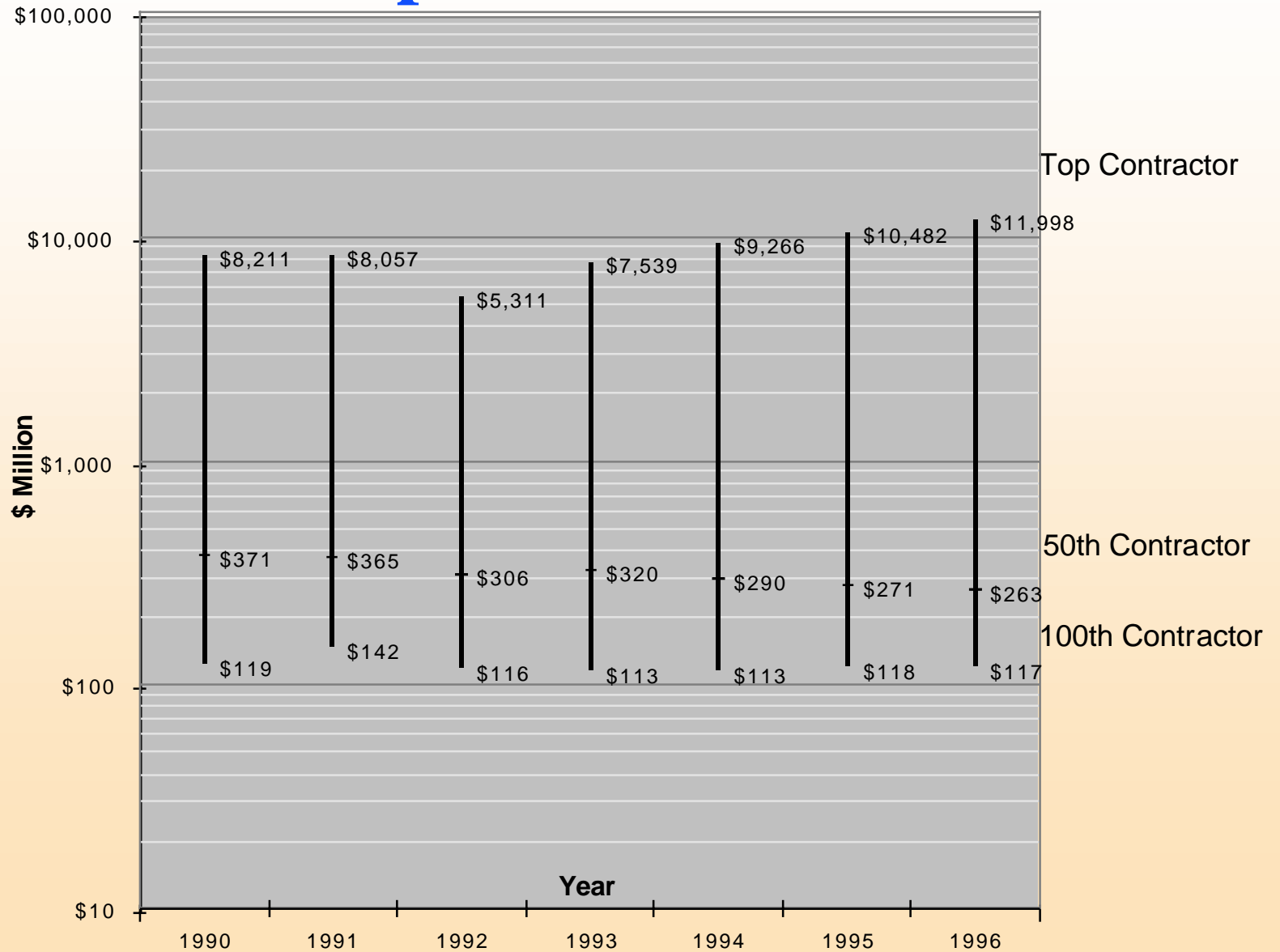
Structure of the Industrial Base

Cum Contract \$ in Thousands since 1990





Distribution of Contracts among the Top 100 Contractors





Defense Industry Restructuring

“The panel has little confidence in the Defense Department’s understanding of what is needed to withstand the defense cuts and preserve a viable base....If the restructuring continues in the Pentagon’s current laissez-faire manner, it could result in the loss of critical design and manufacturing capabilities.”

Report of the Structure
of U.S. Defense Industrial Base
Comm. on Armed Services
House of Representatives, April 1992 p.2

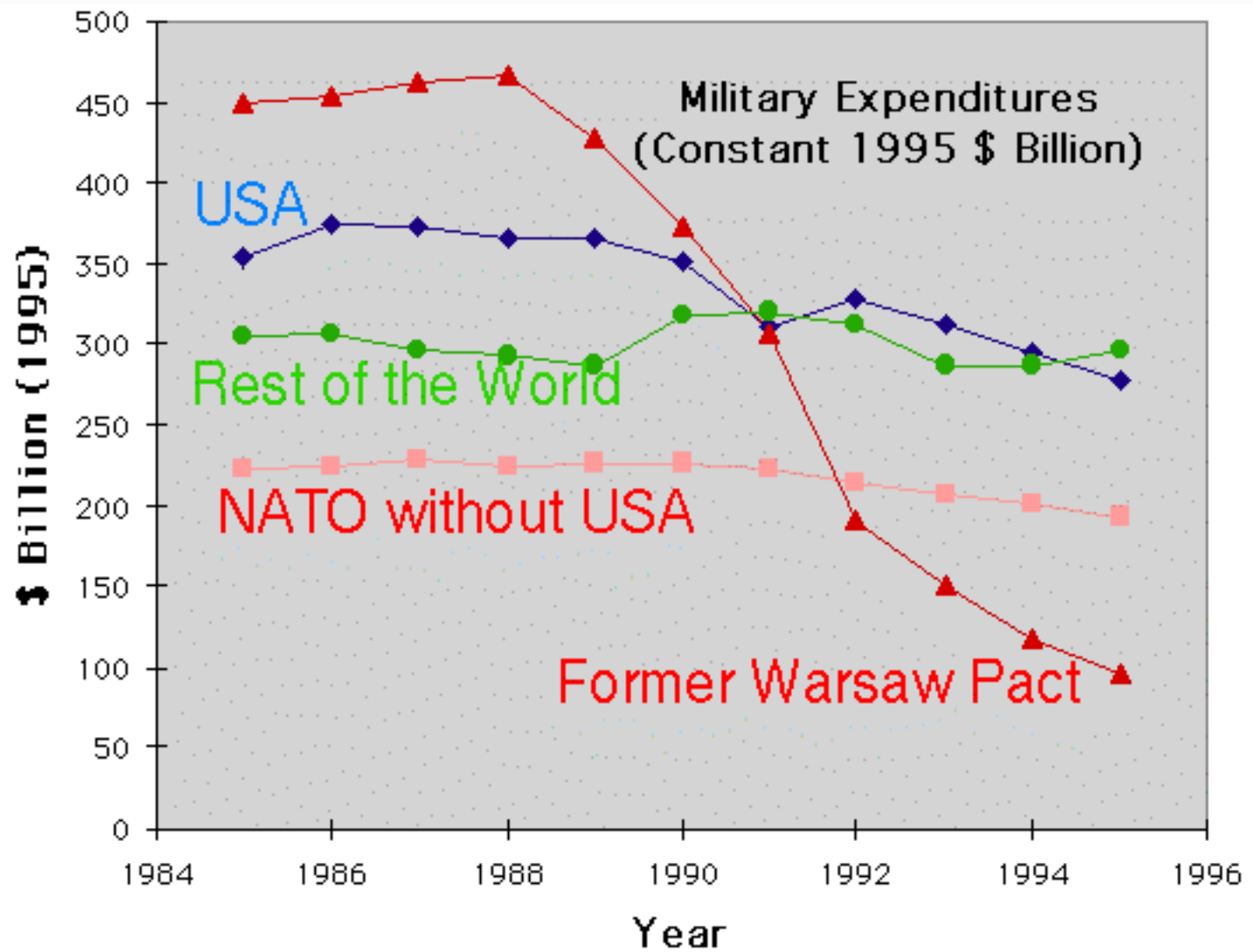


Changing Threat





The Threat

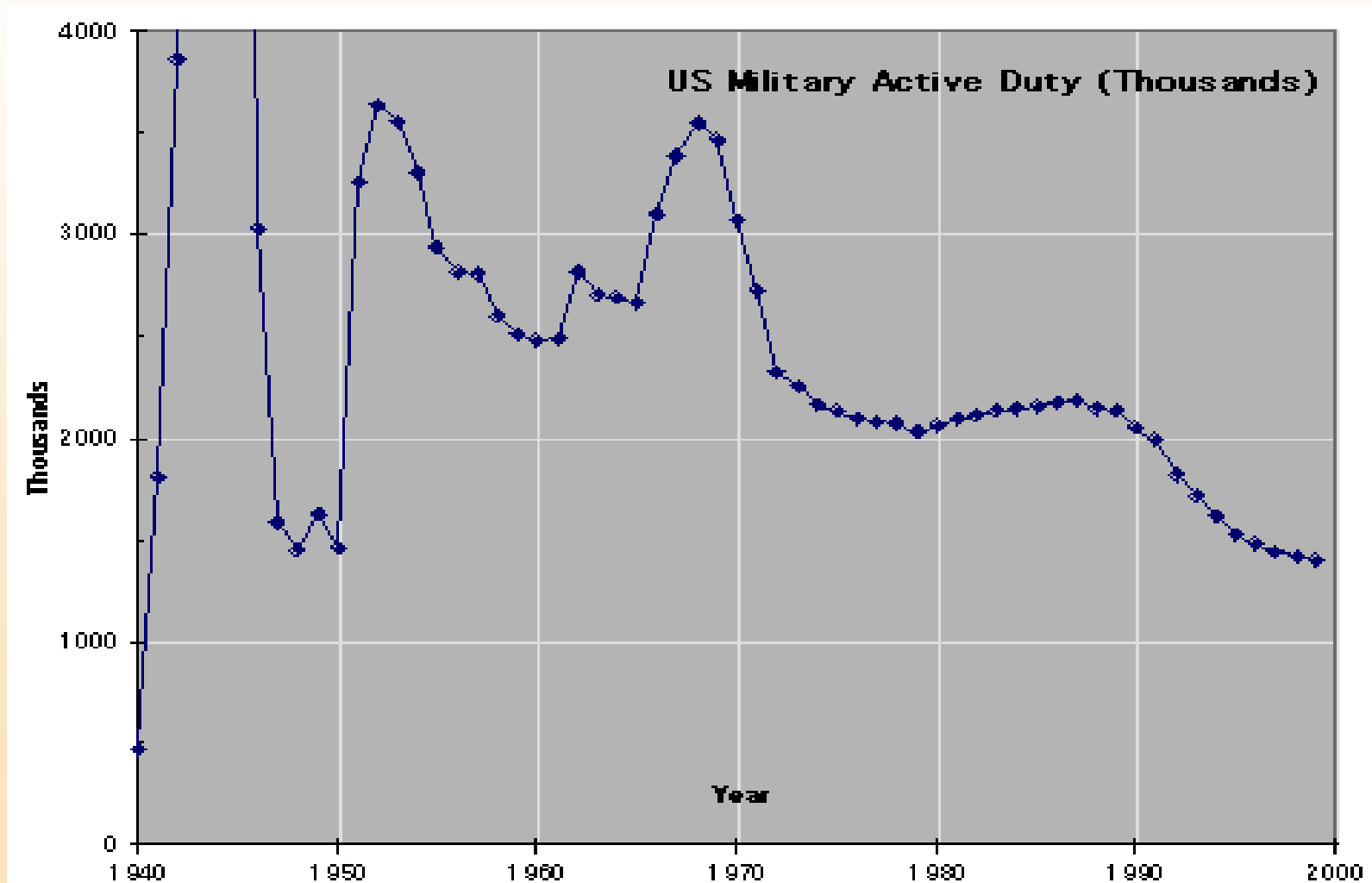


Source: US Arms Control and Disarmament Agency



Down Sized Military

Active Military Personnel (thousands)





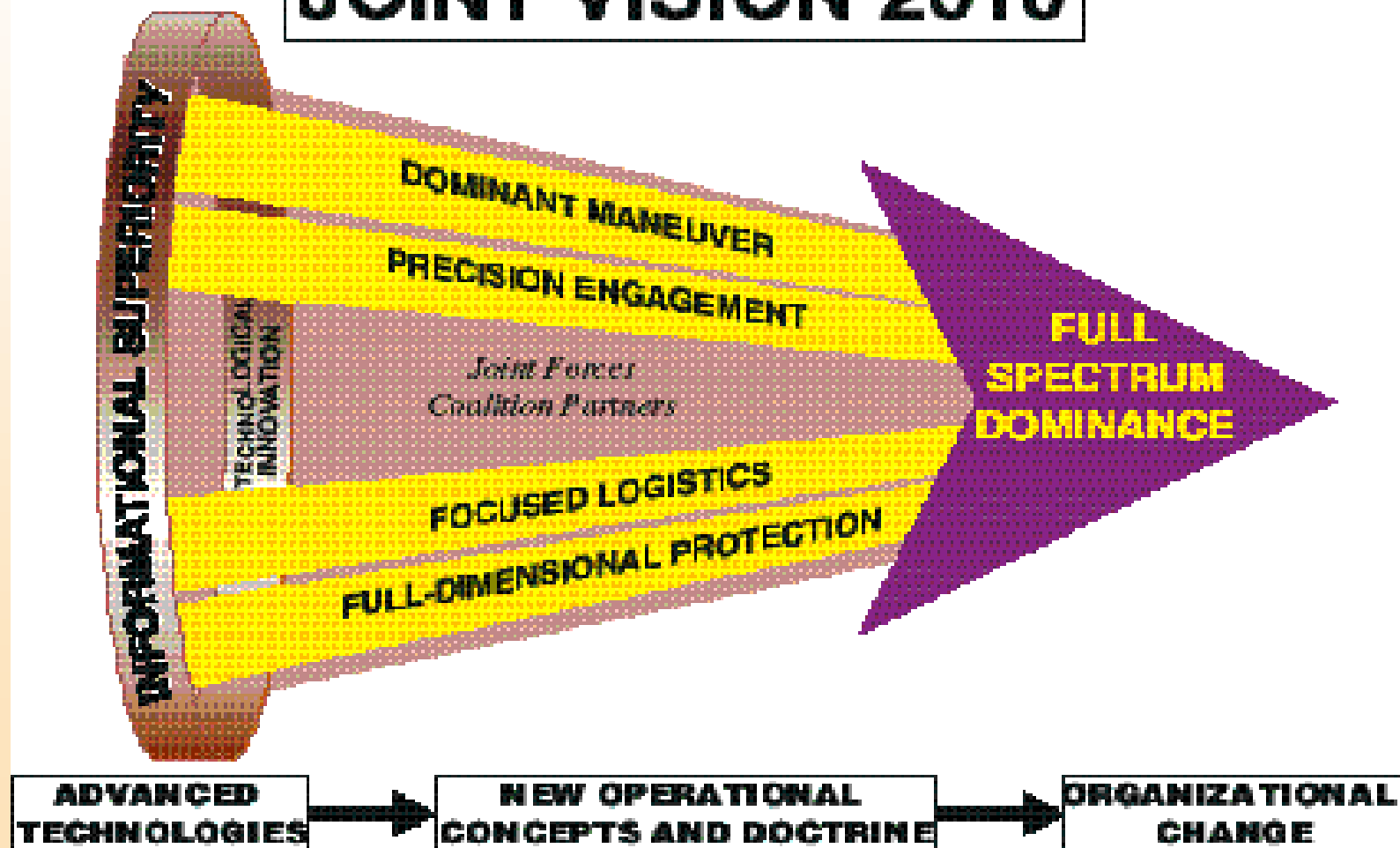
U. S. Battle Deaths

WW I	53000
WW II	292000
Korea	34000
Vietnam	47000
Beirut Barracks	254
Desert Storm	147
Somalia	29
Bosnia	1



Role of the CinCs/Jointness

JOINT VISION 2010



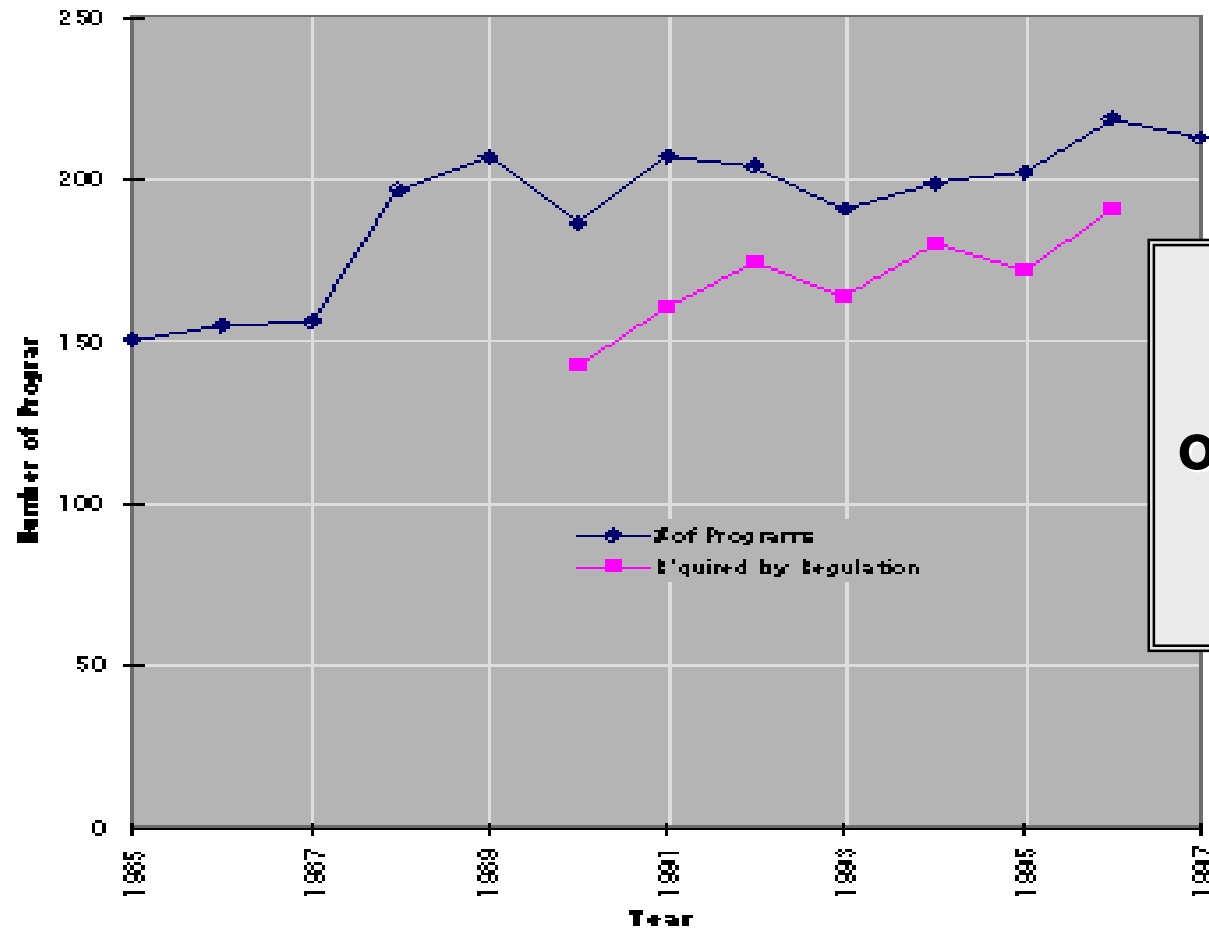


Technological Innovation

- **Invention of iron, bronze, long bow, rifle, airplane, or nuclear weapons**
- **Is Information Technology, IW, or Stealth really in the same league?**
- **Modeling and Simulation may be the most promising recent technological innovation, at least for test and evaluation**



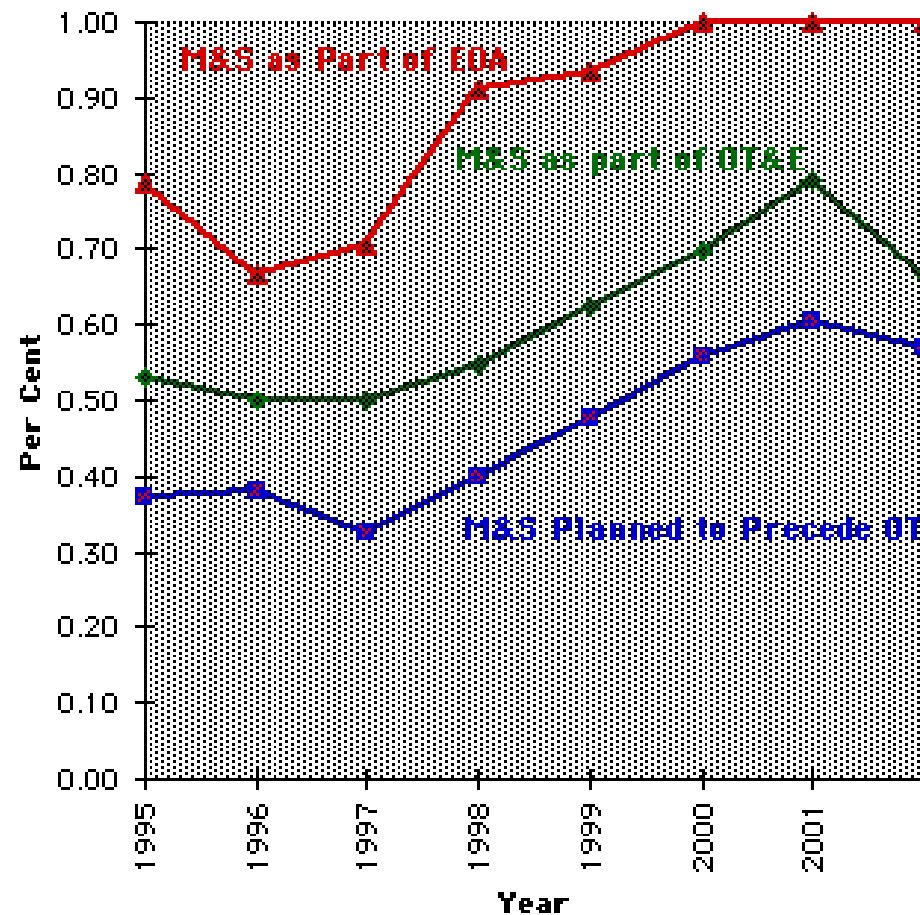
Number of Oversight Programs



The Number of Programs of interest has not changed significantly



Plans for Modeling and Simulation in OT&E Programs



1996 Estimate



Cradle to Grave Application



- **Combat development**
- **Engineering and manufacturing development**
- **Test and evaluation**
- **Training**
- **Sustainment**



**Modeling
&
Simulation**



Myths



- Operational testers won't use M&S
- M&S is cheap
- Testing and M&S are opposite ends of a balance scale

**TRUTH IS: M&S and testing are intertwined;
when they are not, neither is effective**

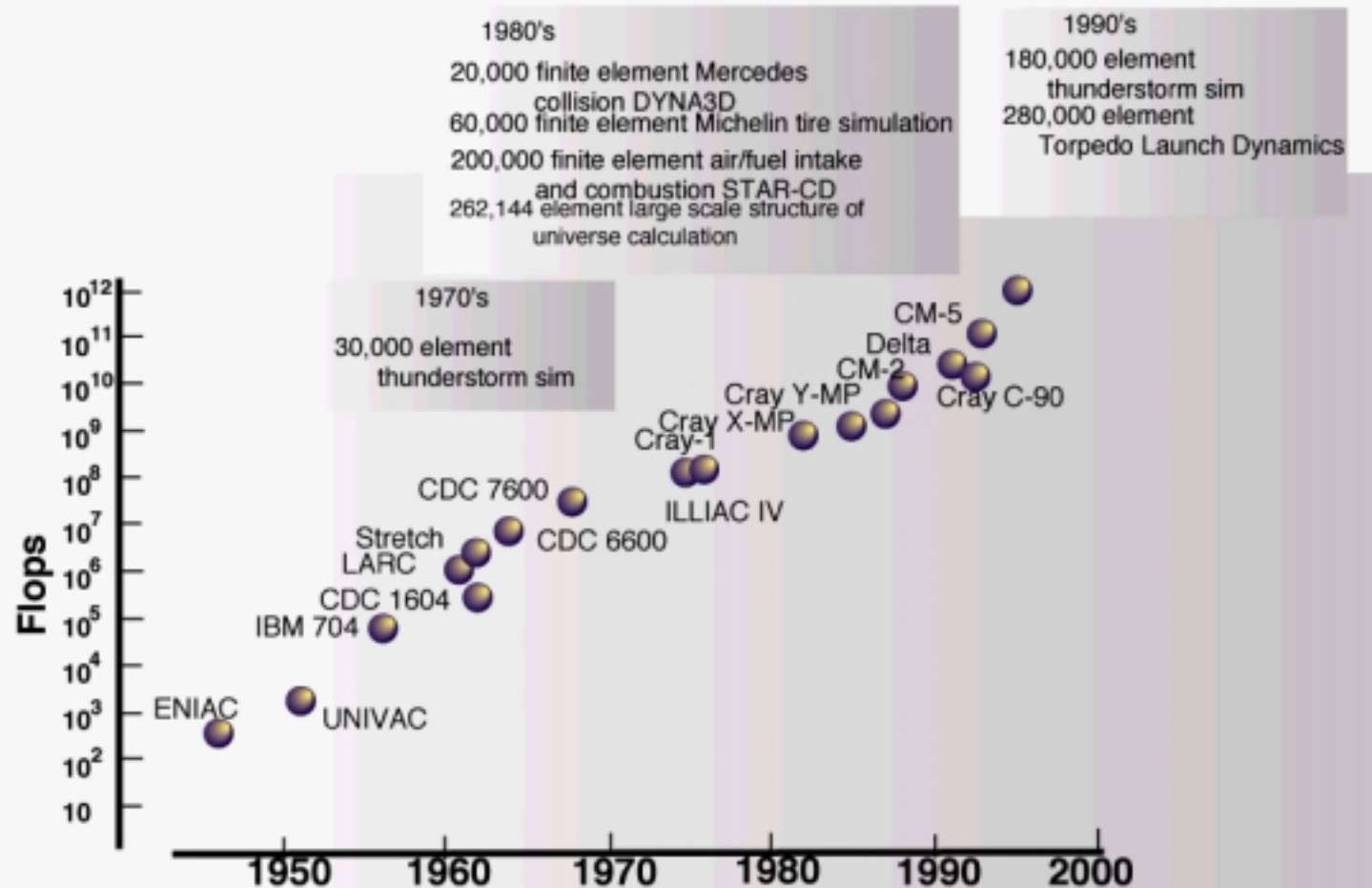


Strong DOT&E Support for M&S



- My own experience
- Simulation **T**est and **E**valuation **P**rocess
- Critical to future success
- Integrating M&S and T&E

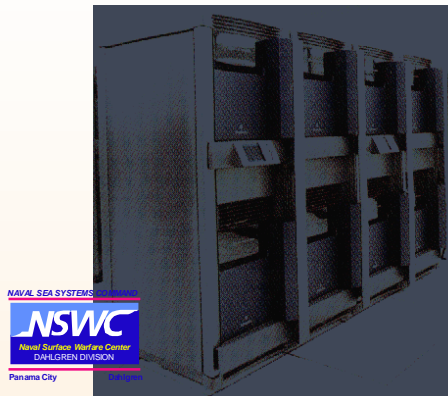
UNDERSTANDING: INSIGHT NOT OVERSIGHT



Source: Kaufmann, W. J. and Smarr, L. L., *Supercomputing and the Transformation of Science*, Scientific American Library, 1993



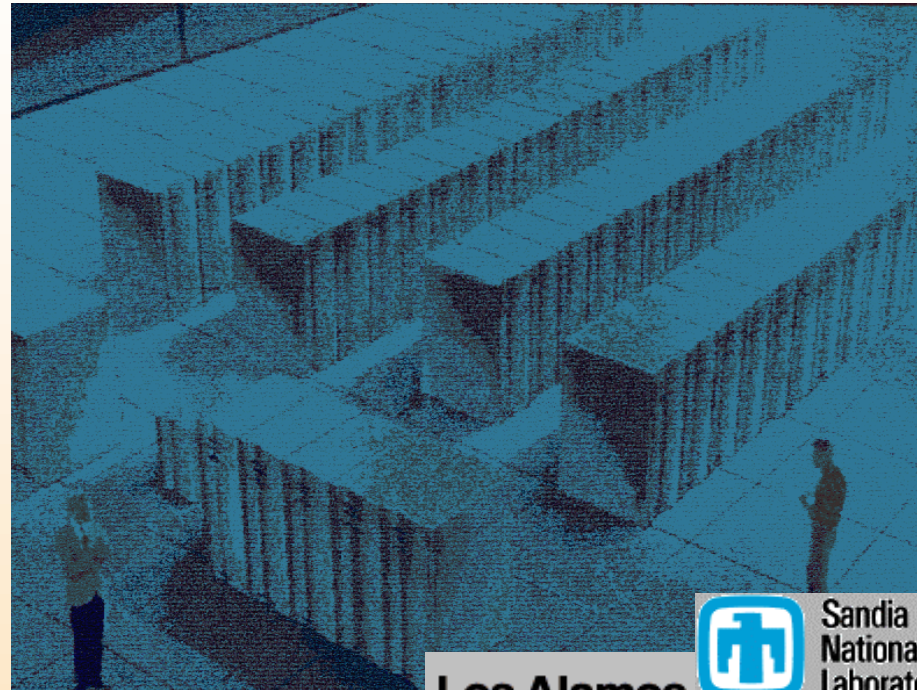
Computational Resources



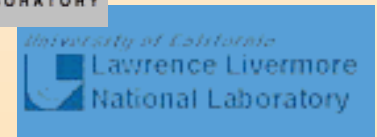
**NSWCDD Dahlgren
20 GFLOPS**



**PARAGON
140 GFLOPS**



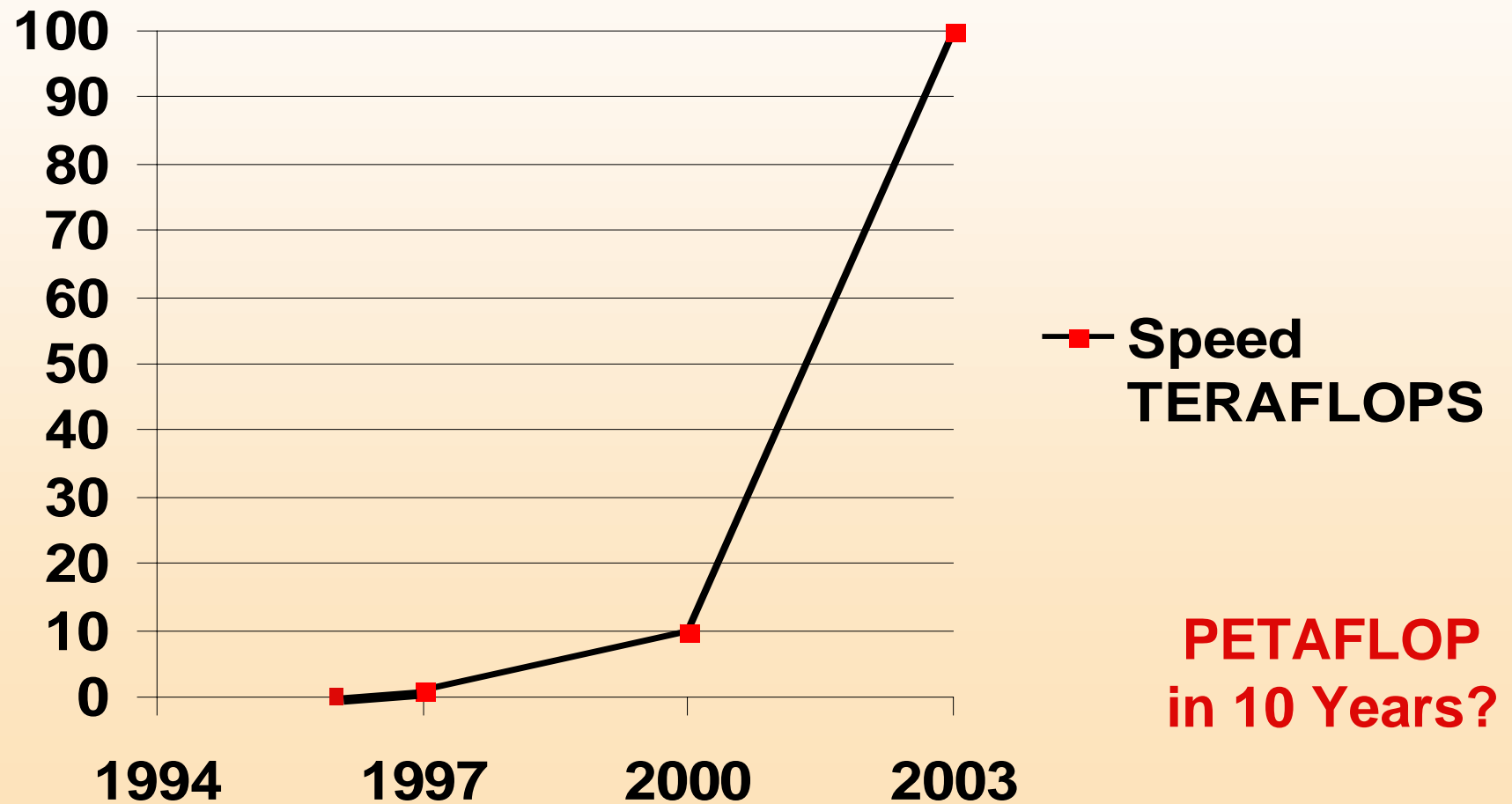
**Los Alamos
NATIONAL LABORATORY**



**3.2 TFLOPS
(3200 GFLOPS!)**

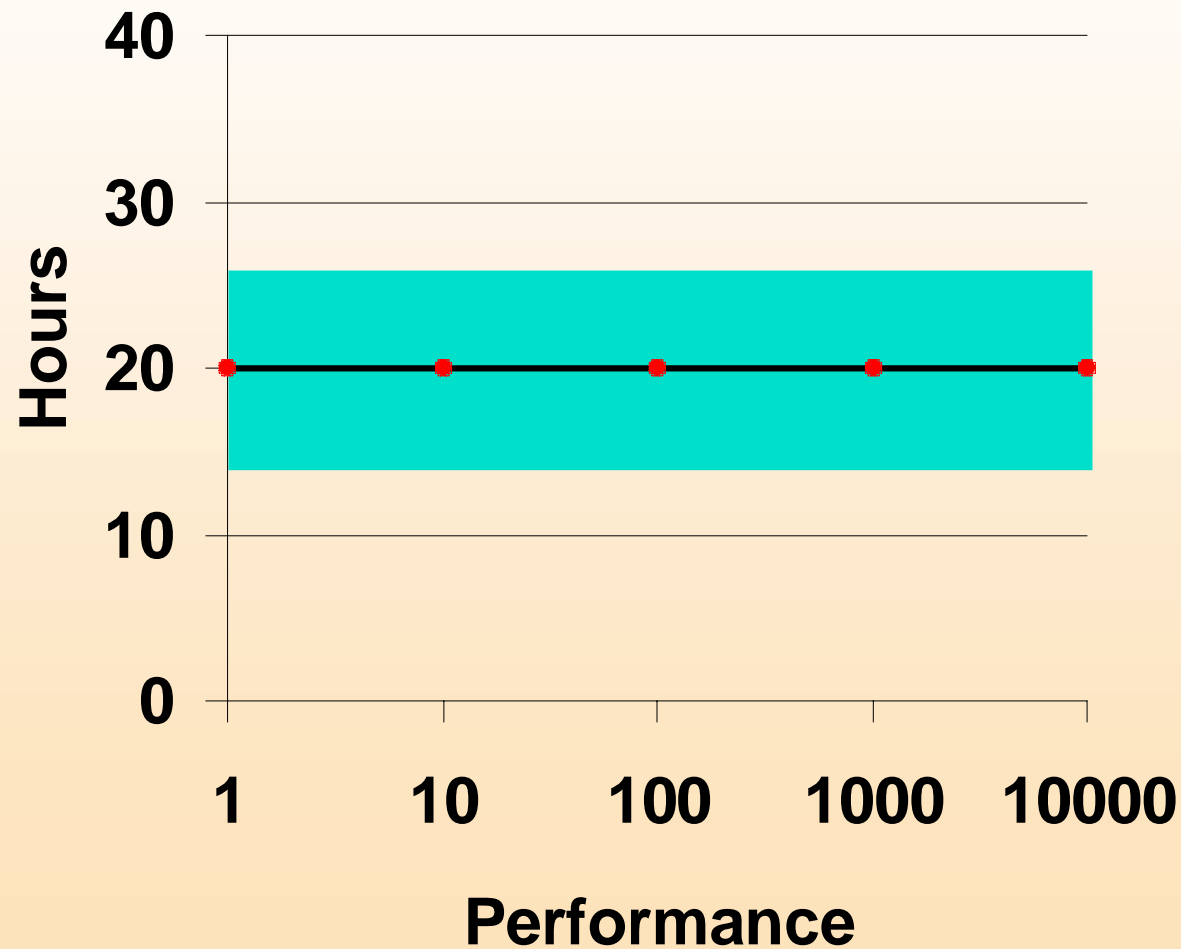


Advances in Computing Speed





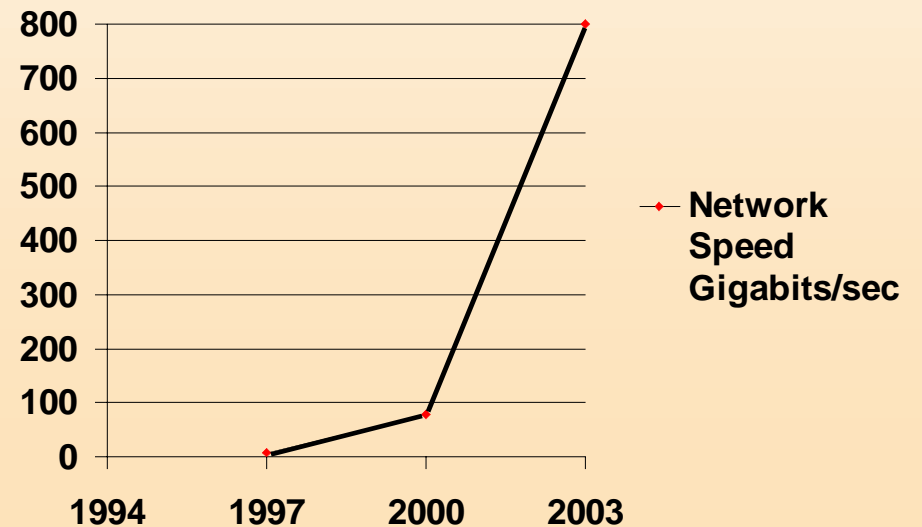
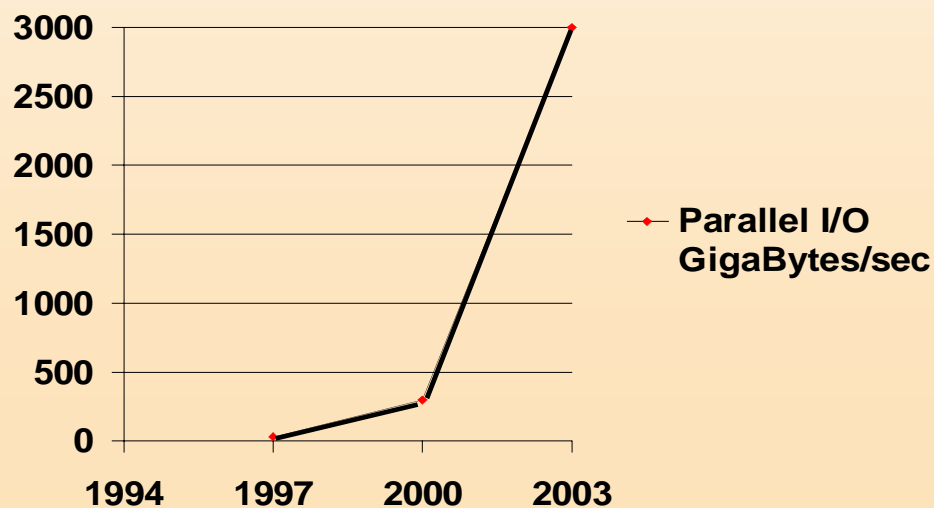
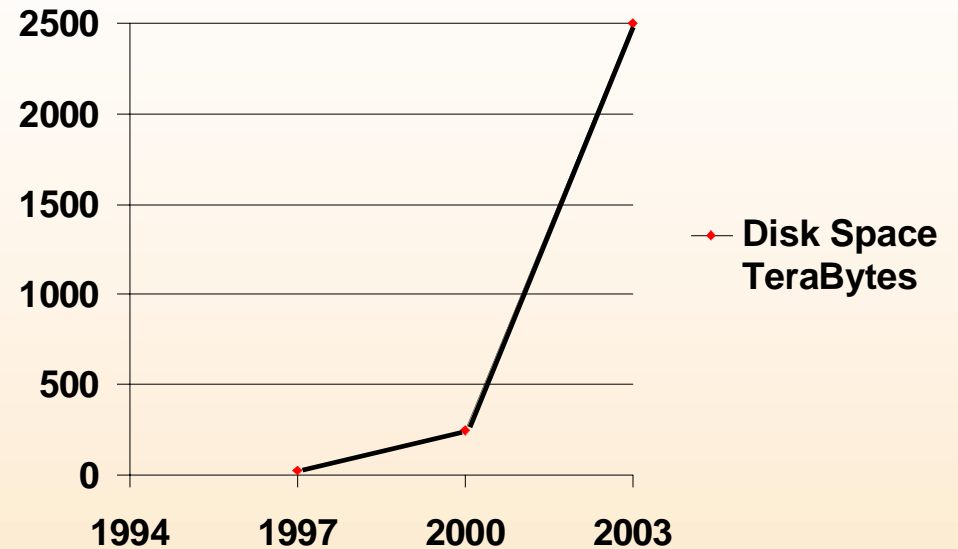
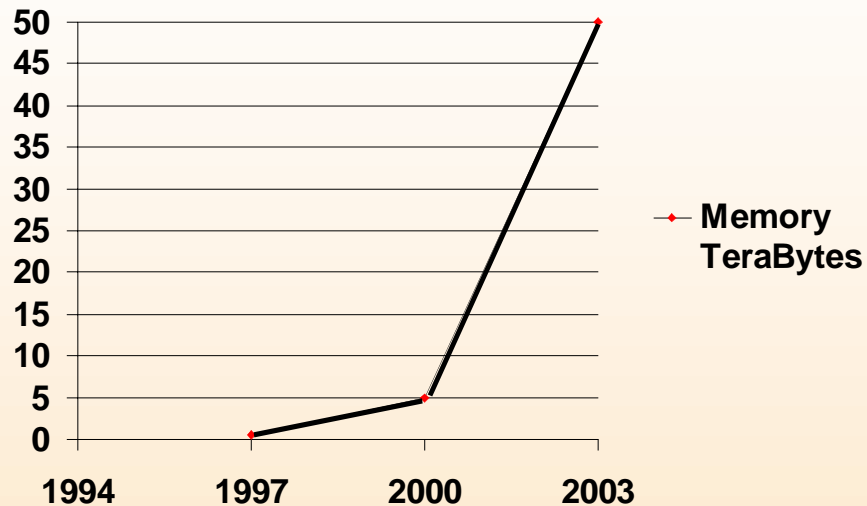
Net Increase in Human Patience



Patience
(in Hours)



Advances In Capability





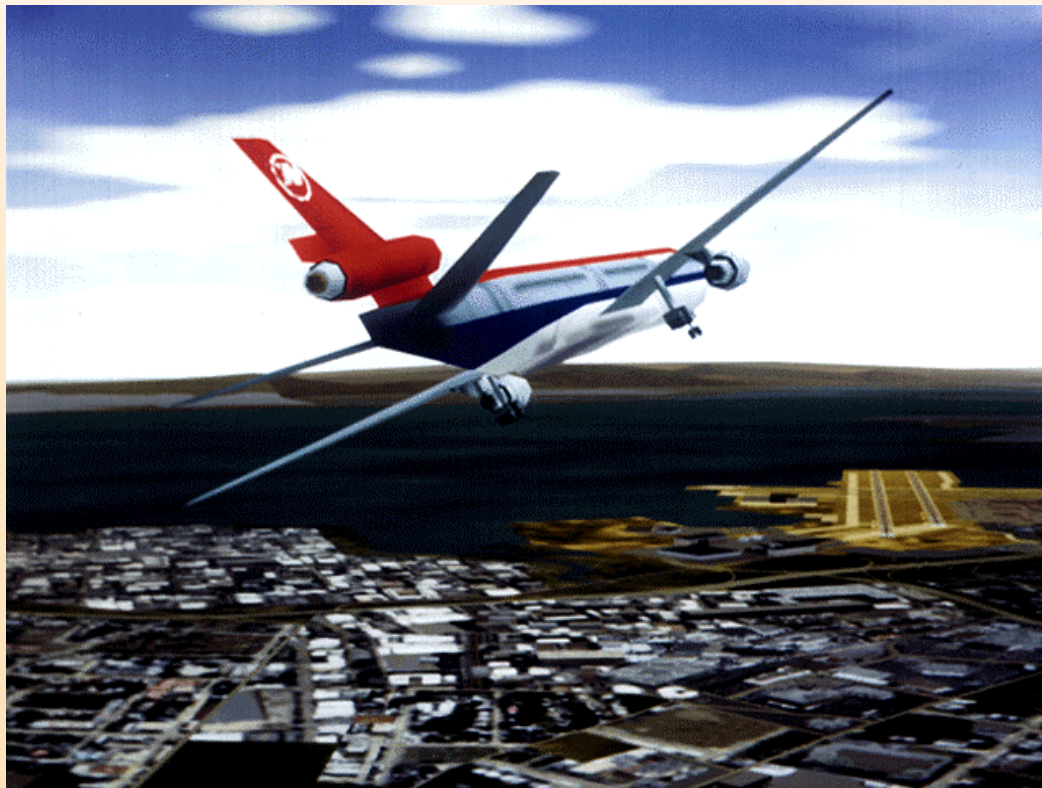
Overall Capability by 2003

■ Computational Speed	100 TeraFLOPS
■ Memory	50 TeraBytes
■ Disk Space	2.5 PetaBytes
■ Parallel I/O	3 TeraBytes/sec
■ Network Speed	800 Gigabits/sec
■ Archival Storage	300 Petabytes



NASA Flight Simulation

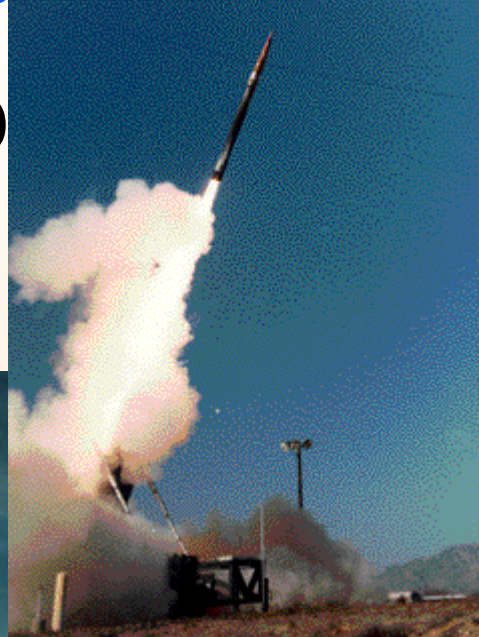
**Computer generated
scenarios for pilot training**





Missile Programs are Using Hydrocodes for Lethality Studies

THAAD



Navy Area



PAC-3





Don't Worry So Much About VV&A

- Focus on why, not just how M&S is being used
- Traditional VV&A works best for interpolation
- In research and testing, we are often extrapolating
 - In these cases VV&A comes with repeated use
- “Unaccredited” models can produce great insights



What needs to be done!



- Earlier involvement
- M&S in IPTs
- TEMPS that pay close attention to how M&S is used:
 - OT&E and LFT&E will be planned with models
 - Pre-test predictions and test data will be reconciled
- CAD/CAM to vulnerability model links
- OT&E events planned and predictive with model runs
- Continuously improve models with test results

Budgets for M&S



Change in Defense --> T&E Implications

■ Spending

■ Industrial base

■ The threat

■ Down-sized military

■ Joint Operations

■ Technological innovation

More effective systems
Earlier insight during design

More Flexible and
Survivable systems
Manpower and O&M
evaluations

New Evaluation Contexts

M&S